

WHAT IS CLAIMED IS:

1. A method of determining handoff timing parameters for a wireless device, comprising:

- a) measuring a call characteristic;
- b) determining if the call characteristic is relevant to current conditions;
- c) in response to determining the call characteristic is relevant, determining an adapted value for handoff timeout based on the call characteristic; and
- d) setting the handoff timeout to the adapted value.

2. The method of Claim 1 wherein the call characteristic is selected from the group consisting of handoff frequency, energy level crossing, motion of the wireless device, energy variance, and signal quality.

3. The method of Claim 1 wherein determining the adapted value includes;

- determining a predicted handoff performance; and
- determining the adapted value for the handoff timeout based on the predicted handoff performance.

4. The method of Claim 3 wherein determining the predicted handoff performance includes;

collecting statistics of the call characteristic; and  
computing the predicted handoff performance based on the  
call characteristic statistics.

5. The method of Claim 3 wherein determining the  
adapted value includes applying an adaptation function to a  
current value of the handoff timeout.

6. The method of Claim 5 wherein the adaptation  
function limits the adapted value between a maximum value and  
a minimum value.

7. The method of Claim 5 wherein the adaptation  
function is selected from the group consisting of a linear  
function, a multi-order function, incrementing or decrementing  
by a fixed quantity, and selecting a value from a lookup  
table.

8. The method of Claim 3 wherein the step of  
determining the adapted value includes setting the handoff  
timeout value to a nominal value within a range of values.

9. The method of Claim 1 further comprising setting the  
handoff timeout value to a default value if the call  
characteristic is not relevant to current conditions.

10. The method of Claim 9 wherein the default value is selected from the group consisting of a minimum value, a maximum value, a mid-point value between the minimum value and maximum value, and a specified nominal value.

11. The method of Claim 1 wherein determining the adapted value for handoff timeout is executed at a time selected from the group consisting of at the time of requesting to add a potential pilot, at the time of requesting to drop a current pilot, at the time of measuring the call characteristic, at the time a pilot energy crosses a threshold, and periodically.

12. The method of Claim 1 further comprising receiving a range of adapted values of handoff timeout; and limiting the adapted value of the handoff timeout to within the range of adapted values.

13. The method of Claim 1 wherein the method is processed within one or more wireless components selected from the group consisting of mobile stations, base stations, and mobile switching centers.

14. A method of determining handoff timing parameters for a wireless device, comprising:

- a) measuring a call characteristic;
- b) determining if the call characteristic is relevant to current conditions;
- c) if the call characteristic is relevant;
  - i) determining a predicted handoff performance; and
  - ii) determining the adapted value for the handoff timeout based on the predicted handoff performance;
  - iii) setting the handoff timeout to the adapted value; and
- d) if the call characteristic is not relevant, setting the handoff timeout to a default value.

15. The method of Claim 14 wherein the call characteristic is selected from the group consisting of handoff frequency, energy level crossing, motion of the wireless device, energy variance, and signal quality.

16. The method of Claim 14 wherein determining the predicted handoff performance includes;

- collecting statistics of the call characteristic; and
- computing the predicted handoff performance based on the call characteristic statistics.

18. The method of Claim 17 wherein the adaptation function limits the adapted value between a maximum value and a minimum value.

20. The method of Claim 14 wherein the default value is selected from the group consisting of a minimum value, a maximum value, a mid-point value between the minimum value and maximum value, and a specified nominal value.

21. A method of executing a handoff operation in a wireless device, comprising:

searching a radio frequency spectrum for a plurality of pilots;

assigning default values for handoff timeout  
corresponding to each pilot;

determining adapted values for handoff timeout, the adapted values based on a call characteristic associated with each pilot;

making drop decisions for each pilot based on the adapted value of the handoff timeout corresponding to each pilot.

22. The method of Claim 21 wherein determining adapted values includes;

- a) measuring the call characteristic;
- b) determining if the call characteristic is relevant to current conditions;
- c) in response to determining the call characteristic is relevant, determining an adapted value for handoff timeout of a corresponding pilot based on the call characteristic; and
- d) setting the handoff timeout of the corresponding pilot to the adapted value.

23. The method of Claim 22 wherein the call characteristic is selected from the group consisting of handoff frequency, energy level crossing, motion of the wireless device, position of the wireless device, signal quality, and energy variance.

24. The method of Claim 21 wherein determining adapted values includes;

determining a predicted handoff performance corresponding to each pilot; and

determining adapted values for the handoff timeout of each pilot based on the corresponding predicted handoff performance.

25. The method of Claim 24 wherein determining the predicted handoff performance includes;

collecting statistics of the call characteristic; and

computing the predicted handoff performance based on the call characteristic statistics.

26. The method of Claim 21 wherein determining adapted values for handoff timeout is executed at a time selected from the group consisting of at the time of requesting to add a potential pilot, at the time of requesting to drop a current pilot, at the time of measuring the call characteristic, at the time a pilot energy crosses a threshold, and periodically.

27. The method of Claim 21 wherein the method is processed within one or more wireless components selected from the group consisting of mobile stations, base stations, and mobile switching centers.

28. A method of executing a handoff operation in a wireless device, comprising:

searching a radio frequency spectrum for a plurality of pilots;

forming a plurality of sets of associated pilots;

assigning a default value for handoff timeout corresponding to each set of pilots;

determining adapted values for handoff timeout, the adapted values based on a call characteristic associated with each set of pilots;

making drop decisions for each pilot based on the adapted value of the handoff timeout corresponding to each pilot's set.

29. A system for determining handoff timing parameters for a wireless device, comprising:

a controller to measure a call characteristic that is relevant to current conditions, the controller to determine an adapted value for handoff timeout based on the call characteristic, and to set the handoff timeout to the adapted value.

30. The system of Claim 29 wherein the call characteristic is selected from the group consisting of



handoff frequency, energy level crossing, motion of the wireless device, energy variance, and signal quality.

31. The system of Claim 29 wherein the adapted value for handoff timeout is determined at a time selected from the group consisting of at the time of requesting to add a potential pilot, at the time of requesting to drop a current pilot, at the time of measuring the call characteristic, at the time a pilot energy crosses a threshold, and periodically.

32. The system of Claim 29 wherein the controller collects statistics of the call characteristic and computes the predicted handoff performance based on the call characteristic statistics.

33. The system of Claim 29 wherein the controller determines a predicted handoff performance and determines the adapted value for the handoff timeout based on the predicted handoff performance.

34. A system for performing handoffs in a wireless communication network, comprising:

- a) a mobile station;
- b) a plurality of base stations;
- c) a dynamic handoff timeout algorithm for adapting a

handoff timeout value; and

d) a parameter configuration protocol for communicating parameters for use by said dynamic handoff timeout algorithm from one or more of said plurality of base stations to said mobile station.

35. The system of Claim 34 further comprising:

a controller to measure a call characteristic.

36. The system of Claim 35 wherein said dynamic handoff timeout algorithm is executed at a time selected from the group consisting of at the time of requesting to add a potential pilot, at the time of requesting to drop a current pilot, at the time of measuring a call characteristic, at the time a pilot energy crosses a threshold, periodically, and at the time said parameters are updated from the network.

37. The system of Claim 35 wherein at least one of said base stations generates a pilot having an energy level; and wherein said dynamic handoff timeout algorithm decrements said handoff timeout value for the pilot if said mobile station predicts, based on said call characteristic that said pilot energy level will be below a threshold for a time greater than a maximum allowed handoff timeout value.

38. The system of Claim 37 wherein said maximum allowed handoff timeout value is multiplied by a hysteresis factor before said mobile station predicts.

39. The system of Claim 35 wherein at least one of said base stations generates a pilot having an energy level; and wherein said dynamic handoff timeout algorithm increments said handoff timeout value for the pilot if said mobile station predicts, based on said call characteristic, said pilot energy level will be below a threshold for a time less than a maximum allowed handoff timeout value.

40. The system of Claim 39 wherein said maximum allowed handoff timeout value is multiplied by a hysteresis factor before said mobile station predicts.

41. The system of Claim 35 wherein said dynamic handoff timeout algorithm determines an adapted value for handoff timeout based on said call characteristic and sets the handoff timeout to said adapted value.

42. The system of Claim 35 wherein the call characteristic is selected from the group consisting of handoff frequency, energy level crossing, motion of the wireless device, energy variance, and signal quality.

43. The system of Claim 35 wherein said dynamic handoff timeout algorithm comprises:

- a) a pilot set maintenance component including pilot drop handoff timers;
- b) a searcher component to measure pilot energies;
- c) a handoff timeout adaptation algorithm for determining an adapted value for handoff timeout based on said call characteristic.

44. The system of Claim 43 further comprising a relevant history determination component that limits said adaptation algorithm to use a default value when said call characteristic is not currently relevant.

45. The system of Claim 44 wherein relevance of said call characteristic is a function of the time since the last handoff of a plurality of pilots.

46. The system of Claim 44 wherein said default value is selected from the group consisting of a minimum value, a maximum value, a mid-point value between the minimum value and maximum value, and a specified nominal value.

47. The system of Claim 34 wherein said dynamic handoff timeout algorithm is implemented in said mobile station.

48. The system of Claim 34 wherein said dynamic handoff timeout algorithm is implemented in one or more of said plurality of base stations.

49. The system of Claim 34 wherein said parameters communicated by said parameter configuration protocol include a Nominal Handoff Timeout value and a Handoff Timeout Deviation value which are used to specify the end-points of a range of allowed values for said adapted handoff timeout as follows:

$$[\text{Nominal Handoff Timeout} \times (1 - 2^{8-\text{Handoff Timeout Deviation}})] \text{ and } [\text{Nominal Handoff Timeout} \times (1 + 2^{8-\text{Handoff Timeout Deviation}})].$$

50. The system of Claim 34 wherein said parameters communicated by said parameter configuration protocol include parameters selected from the group consisting of a nominal handoff timeout value, a range of handoff timeout values about a nominal handoff timeout value, a maximum handoff timeout value, a minimum handoff timeout value, an index into a table of parameter configurations stored in said mobile station, a plurality of inputs to a plurality of formulae that indirectly determine the values of parameters, a minimum time since the

mobile station last dropped, a hysteresis compensation factor, an adaptation value to increment the handoff timeout value, and an adaptation value to decrement the handoff timeout value.

51. The system of Claim 34 wherein said parameter configuration protocol communicates said parameters from said plurality of base stations to said mobile station using messages selected from the group consisting of overhead messages, parameter messages, traffic messages, idle messages, and handoff messages.

52. The system of Claim 34 wherein said mobile station includes memory for storing said parameters.

53. A method for testing a dynamic handoff timeout algorithm used within a wireless communication system, comprising:

a) communicating a plurality of test inputs representing channel signals to a mobile station, each of the plurality of test inputs having an energy level;

b) communicating dynamic handoff timeout algorithm parameters to said mobile station;

c) operating said mobile station in call mode using said test inputs;

d) periodically varying the energy level of at least one of the plurality of test inputs above a pilot add threshold and below a pilot drop threshold;

e) performing said dynamic handoff timeout algorithm;

f) monitoring handoffs and handoff timing associated with the mobile station ; and

g) comparing said handoffs and handoff timing to a minimum performance reference.

54. The method of Claim 53 further comprising varying the time said energy level of at least one of said plurality of test inputs is above said add threshold and below said drop threshold.

55. A method of executing a handoff operation in a wireless device, comprising:

searching a radio frequency spectrum for a pilot;

assigning a default value for handoff timeout corresponding to the pilot;

determining an adapted value for handoff timeout, the adapted value based on a call characteristic associated with the pilot;

making drop decisions for the pilot based on the adapted value of the handoff timeout corresponding to the pilot.

56. The method of Claim 55 wherein determining an adapted value includes;

- a) measuring the call characteristic;
- b) determining if the call characteristic is relevant to current conditions;
- c) in response to determining the call characteristic is relevant, determining the adapted value for handoff timeout based on the call characteristic; and
- d) setting the handoff timeout to the adapted value.

57. The method of Claim 55 wherein the call characteristic is selected from the group consisting of handoff frequency, energy level crossing, motion of the wireless device, position of the wireless device, signal quality, and energy variance.